

backwards, e.g., with shortened side wall 47 on the left hand side of the view as shown in Fig. 7 will result in the connector element 58 being prevented from being inserted into the respective receptor slot portion of the receptor well 18, as, for example, by the connector element 58 engaging the top of the flexible detent element 90 in a manner that will not induce the detent member to flex to give way for the insertion of the connector element 58, as occurs, e.g., when the module 40 is inserted in the proper alignment and positioning such that the setting flange is properly aligned such that, e.g., its slanted portion 65 engages the top inwardly slanting surface of the flexible detent member 90 and flexes the detent member 90 to allow engagement of the setting flange 64 by the detent member 90 when it bends back into the upright position.

In operation, therefore, the present invention may be utilized to insure, e.g., that the module 40 and its connector element 58 are properly inserted so as to insure correct connector contact between the respective male and female elements, e.g., pins 86 and receptacles 74, and that the installer cannot attempt to force a connection with a misalignment/mispositioning of the module, causing damage to either of the male or female connector elements 58, 80, and particularly, e.g., bent pins 86.

While the preferred embodiments of the present invention have been shown and described, it will be apparent to those skilled in the art that various modifications may be made in these embodiments without departing from the spirit of the present invention. For that reason, the scope of the invention is set forth in the following claims:

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We claim:

1. A controller module unit, comprising:
  - a printed circuit board having an upper surface;
  - a plurality of controller module connectors of a first type mounted on the printed circuit board, each controller module first type connector comprising:
    - an elongated body;
    - a plurality of first type connector elements arranged generally in alignment with the length of the elongated body;
    - a flexible latching detent attached to the elongated body;
  - a controller module, comprising:

a controller module housing having a top wall, a bottom wall and a pair of opposing elongated side walls and a pair of opposing shorter side walls, and a module connector element of a second type extending from the bottom wall,

5 the module housing second type connector comprising:

an elongated second type connector body having a plurality of second type connector elements arranged generally in alignment with the length of the elongated connector body;

10 an elongated generally rigid latching member extending along one side of the elongated second type connector body;

a controller module alignment and positioning frame mounted on the printed circuit board;

the controller module positioning and alignment frame comprising:

15 a front wall and a rear wall, each having an interior surface a connector bay containing a respective one of the controller module first type connectors;

20 a first and a second guide shelf extending generally parallel to the upper surface of the printed circuit board, the separation of each of the first and second guide shelves from each other defining a first dimension of the connector bay;

at least one guide wall extending vertically upward from each of the first and second guide shelves, the position of the at least one guide wall defining a second dimension of the connector bay for the respective module first type connector;

25 wherein the first and second guide shelves are positioned with respect to the respective connector bay and the respective first type connector element is positioned with respect to the connector bay and the second type connector element is positioned with respect to the bottom wall of the module housing such that when a first one of the pair of shorter walls of the module housing  
30 is in contact with the interior surface of one of the front and rear walls of the positioning and alignment frame, the module housing second type connector body comes into contact with one of the first and second shelves and when the second one of the pair of shorter walls of the module housing is in contact with the interior surface of the other of the front and rear walls  
35 of the positioning and alignment frame, the module housing second type connector body enters into the respective connector bay and enables

connection between the first and second type connector elements.

2. The apparatus of claim 1 wherein when the first of the pair of shorter walls is in contact with the interior surface of the other of the front and rear walls of the positioning and alignment frame, the body of the module second type connector is prevented from entering the respective receptor bay by engaging the body of the module second type connector.
3. The apparatus of claim 1 in which the first type connector is a male type connector having a plurality of pins and the second type connector is a female connector having a plurality of pin receptacles.
4. The apparatus of claim 1 in which the second type connector is a male type connector having a plurality of pins and the first type connector is a female connector having a plurality of pin receptacles.
5. The apparatus of claim 2 in which the first type connector is a male type connector having a plurality of pins and the second type connector is a female connector having a plurality of pin receptacles.
6. The apparatus of claim 2 in which the second type connector is a male type connector having a plurality of pins and the first type connector is a female connector having a plurality of pin receptacles.
7. The apparatus of claim 1 wherein the bottom wall of the controller module housing has a centerline along its length and the plurality of second type connector elements are aligned displaced from the centerline.
8. The apparatus of claim 2 wherein the bottom wall of the controller module housing has a centerline along its length and the plurality of female connector receptacles are aligned displaced from the centerline.
9. The apparatus of claim 3 wherein the bottom wall of the controller module housing has a centerline along its length and the plurality of male connector pins are aligned displaced from the centerline.

10. The apparatus of claim 4 wherein the bottom wall of the controller module housing has a centerline along its length and the plurality of second type connector elements are aligned displaced from the centerline.

5 11. The apparatus of claim 5 wherein the bottom wall of the controller module housing has a centerline along its length and the plurality of female connector receptacles are aligned displaced from the centerline.

10 12. The apparatus of claim 6 wherein the bottom wall of the controller module housing has a centerline along its length and the plurality of male connector pins are aligned displaced from the centerline.

15 13. The apparatus of claim 3 wherein the flexible latching detent comprises:  
a generally vertical wall having an upper end and a lower end, with an  
upper slanted detent surface protruding from one side of the generally vertical wall  
and a lower slanted detent surface protruding from the same side of the generally  
vertical wall and intersecting the upper slanted surface.

20 14. The apparatus of claim 4 wherein the flexible latching detent comprises:  
a generally vertical wall having an upper end and a lower end, with an  
upper slanted detent surface protruding from one side of the generally vertical wall  
and a lower slanted detent surface protruding from the same side of the generally  
vertical wall and intersecting the upper slanted surface.

25 15. The apparatus of claim 5 wherein the flexible latching detent comprises:  
a generally vertical wall having an upper end and a lower end, with an  
upper slanted detent surface protruding from one side of the generally vertical wall  
and a lower slanted detent surface protruding from the same side of the generally  
vertical wall and intersecting the upper slanted surface.

30 16. The apparatus of claim 6 wherein the flexible latching detent comprises:  
a generally vertical wall having an upper end and a lower end, with an  
upper slanted detent surface protruding from one side of the generally vertical wall  
and a lower slanted detent surface protruding from the same side of the generally  
35 vertical wall and intersecting the upper slanted surface.

17. The apparatus of claim 7 wherein the flexible latching detent comprises:  
a generally vertical wall having an upper end and a lower end, with an  
upper slanted detent surface protruding from one side of the generally vertical wall  
and a lower slanted detent surface protruding from the same side of the generally  
5 vertical wall and intersecting the upper slanted surface.
18. The apparatus of claim 8 wherein the flexible latching detent comprises:  
a generally vertical wall having an upper end and a lower end, with an  
upper slanted detent surface protruding from one side of the generally vertical wall  
10 and a lower slanted detent surface protruding from the same side of the generally  
vertical wall and intersecting the upper slanted surface.
19. The apparatus of claim 9 wherein the flexible latching detent comprises:  
a generally vertical wall having an upper end and a lower end, with an  
15 upper slanted detent surface protruding from one side of the generally vertical wall  
and a lower slanted detent surface protruding from the same side of the generally  
vertical wall and intersecting the upper slanted surface.
20. The apparatus of claim 10 wherein the flexible latching detent comprises:  
20 a generally vertical wall having an upper end and a lower end, with an  
upper slanted detent surface protruding from one side of the generally vertical wall  
and a lower slanted detent surface protruding from the same side of the generally  
vertical wall and intersecting the upper slanted surface.
21. The apparatus of claim 11 wherein the flexible latching detent comprises:  
25 a generally vertical wall having an upper end and a lower end, with an  
upper slanted detent surface protruding from one side of the generally vertical wall  
and a lower slanted detent surface protruding from the same side of the generally  
vertical wall and intersecting the upper slanted surface.
22. The apparatus of claim 12 wherein the flexible latching detent comprises:  
a generally vertical wall having an upper end and a lower end, with an  
upper slanted detent surface protruding from one side of the generally vertical wall  
and a lower slanted detent surface protruding from the same side of the generally  
30 vertical wall and intersecting the upper slanted surface.
23. A controller module unit, comprising:

a printed circuit board having an upper surface;  
 a plurality of controller module connectors of a first type mounted on the  
 printed circuit board, each controller module first type connector  
 comprising:

- 5           an elongated body;
- a plurality of first type connector elements arranged generally in  
           alignment with the length of the elongated body;
- a latching means attached to the elongated body;

a controller module, comprising:

- 10          a controller module housing having a controller module connector  
           element of a second type extending from the controller module  
           housing,

the controller module second type connector comprising:

- an elongated second type connector body having a plurality
- 15          of second type connector elements arranged generally in  
           alignment with the length of the elongated connector body;
- a latching means for, in cooperation with the latching means  
           on the controller module first type connector, holding the  
           controller module first type connector and second type
- 20          connector in a mated position;

a controller module alignment and positioning means mounted on the  
 printed circuit board;

the controller module positioning and alignment means comprising:

- a connector bay containing a respective one of the controller module
- 25          first type connectors;
- guide means for positioning the controller module second type  
           connector element with respect to the controller module first type  
           connector element, including a guide shelf and at least one guide  
           wall extending vertically upward from the guide shelf, for
- 30          preventing the second type connector element from entering the  
           receptor bay unless the first type connector element and the second  
           type connector element are properly aligned and positioned to  
           engage in the mated position.

- 35    23. The apparatus of claim 22 wherein first type connector element and the second  
       type connector element are positioned with respect to the controller module

housing and the receptor bay so as to prevent entry of the controller module second type connector element into the receptor bay if the first type connector element and second type connector element are not properly aligned and positioned to ally the first type connector element and the second type connector element to engage in the mated position.

24. The apparatus of claim 22 in which the first type connector is a male type connector having a plurality of pins and the second type connector is a female connector having a plurality of pin receptacles.

25. The apparatus of claim 22 in which the second type connector is a male type connector having a plurality of pins and the first type connector is a female connector having a plurality of pin receptacles.

26. The apparatus of claim 23 in which the first type connector is a male type connector having a plurality of pins and the second type connector is a female connector having a plurality of pin receptacles.

27. The apparatus of claim 23 in which the second type connector is a male type connector having a plurality of pins and the first type connector is a female connector having a plurality of pin receptacles.

27. The apparatus of claim 22 wherein the controller module housing has a centerline along its length and the plurality of second type connector elements are aligned displaced from the centerline.

29. The apparatus of claim 23 wherein the controller module housing has a centerline along its length and the plurality of female connector receptacles are aligned displaced from the centerline.

30. The apparatus of claim 24 wherein the controller module housing has a centerline along its length and the plurality of male connector pins are aligned displaced from the centerline.

31. The apparatus of claim 25 wherein controller module housing has a centerline along its length and the plurality of second type connector elements are aligned

displaced from the centerline.

32. The apparatus of claim 26 wherein the controller module housing has a centerline along its length and the plurality of female connector receptacles are  
5 aligned displaced from the centerline.

33. The apparatus of claim 27 wherein the controller module housing has a centerline along its length and the plurality of male connector pins are aligned  
10 displaced from the centerline.

34. The apparatus of claim 24 wherein the controller module first type connector  
latching means comprises:

15 a generally vertical flexible wall with a detent means contained on the generally vertical wall.

35. The apparatus of claim 25 wherein the controller module first type connector  
latching means comprises:

20 a generally vertical flexible wall with a detent means contained on the generally vertical wall.

36. The apparatus of claim 26 wherein the controller module first type connector  
latching means comprises:

25 a generally vertical flexible wall with a detent means contained on the generally vertical wall.

37. The apparatus of claim 27 wherein the controller module first type connector  
latching means comprises:

30 a generally vertical flexible wall with a detent means contained on the generally vertical wall.

38. The apparatus of claim 28 wherein the controller module first type connector  
latching means comprises:

35 a generally vertical flexible wall with a detent means contained on the generally vertical wall.

39. The apparatus of claim 29 wherein the controller module first type connector



latching means comprises:

a generally vertical flexible wall with a detent means contained on the generally vertical wall.

- 5     40. The apparatus of claim 30 wherein the controller module first type connector latching means comprises:

a generally vertical flexible wall with a detent means contained on the generally vertical wall.

- 10    41. The apparatus of claim 21 wherein the controller module first type connector latching means comprises:

a generally vertical flexible wall with a detent means contained on the generally vertical wall.

- 15    42. The apparatus of claim 22 wherein the controller module first type connector latching means comprises:

a generally vertical flexible wall with a detent means contained on the generally vertical wall.

- 20    43. The apparatus of claim 23 wherein the controller module first type connector latching means comprises:

a generally vertical flexible wall with a detent means contained on the generally vertical wall.